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<p>(21) International Application Number: <b>PCT/GB97/02950</b></p> <p>(22) International Filing Date: <b>28 October 1997 (28.10.97)</b></p> <p>(30) Priority Data: <b>9622349.0 28 October 1996 (28.10.96) GB</b></p> <p>(71) Applicant (<i>for all designated States except US</i>): THEREFORE LIMITED [GB/GB]; 2 Huntsworth Mews, London NW1 6DD (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (<i>for US only</i>): RIDDIFORD, Martin, Philip [GB/GB]; 93 Calton Avenue, London SE21 7DF (GB).</p> <p>(74) Agent: GALLAFENT &amp; CO.; 9 Staple Inn, London WC1V 7QH (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i> <i>With amended claims and statement.</i></p>	
<p>(54) Title: <b>HAND-HELD COMPUTER AND COMMUNICATIONS APPARATUS</b></p> <p>(57) Abstract</p> <p>Combined computer and communications apparatus is described which is constructed with a two-part casing, the parts (1, 2) being hinged together. When folded together, the entire unit can act like a mobile phone (Fig. 1) and when unfolded (Fig. 2) a keyboard (5) is exposed enabling it to act as a palmtop computer. In accordance with the invention, the keyboard (5) is folded about a line running substantially perpendicular to the direction of the rows of keys. One casing portion (1) may have a window (4) through which a screen (3) mounted on the other casing portion (2) may be viewed when the unit is folded.</p>			

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HAND-HELD COMPUTER AND COMMUNICATIONS APPARATUS

5 This invention relates to hand-held computer and communications apparatus.

In recent years, there has been a revolution both within computing and telecommunications which has placed great emphasis on making computing and communications devices 10 more powerful, smaller, and lighter. This has applied in the areas of both computing and communications technology.

15 In the former, personal computers have shrunk first to the portable computer, then the laptop and, most recently, the palmtop. In the case of both laptop and palmtop the tendency has been to structure the device as a hinged foldable unit, with a screen-containing flap rotating about a line parallel with rows of keys in a 20 standard keyboard. This arrangement has the advantage of protecting the generally sensitive screen when the device is out of use. It also has the advantage of preserving the efficient data entry achievable using a standard "typewriter" form of keyboard. Millions of people are

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familiar with these and comfortable when using one, even if inefficiently by pecking with two fingers rather than using all the fingers and both thumbs. Attempts to dispense with the standard well-known typewriter keyboard have attracted few adherents. The generally oblong shape of the keyboard has impelled the use in many applications of a generally oblong "landscape" format screen located above it, and this is a feature of most laptop and palmtop computer apparatus.

10

In the mobile telephone field, mobile telephones requiring a power pack to operate them have been replaced by simple hand-held units with a re-chargeable power supply, but giving adequate performance to ensure their widespread adoption. The hand-held units generally resemble a stubby handset, and are normally used by holding the whole unit by the side of the head, with one end adjacent one ear, an aerial projecting from the top, and the lower end of the unit, containing a microphone, near the mouth of the user. As the power of "microchips" has increased, suggestions have been made to enhance the basic mobile telephone unit with further functions.

15

WO93/18591 GB-A-2291560 and GB-A-2297662 show three approaches to providing a mobile phone with a keyboard or touchscreen input. None of these constructions is convenient to use as the stubby handset overall shape is inappropriate, nor is the docking telephone handset incorporating a keyboard and adjacent single line display disclosed in US-A-4661659.

20

EP-A-0534478 discloses a combined mobile telephone unit and electronic notebook. A telephone keypad is mounted one side of a flap which can be lifted away from the main body of the unit to reveal function keys on the main body

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and additional ones on the back of the flap. Together  
these constitute a keyboard which may be used to enter  
notebook data. However, the arrangement is not convenient  
to use, the flap is only supported at one edge when  
5 folded out, and the screen display is small. The ease of  
use of a conventional palmtop is not approached.

In the area of hand-held calculators, some enhanced  
10 "calculator" constructions have been produced where the  
calculators have been constructed with two sections  
openable out like a conventional portrait format book. In  
several known such calculators the standard numeric and  
function key keypad and a relatively small display have  
been mounted in one half and a set of enhanced function  
15 keys as a keypad set in the other half.

We have now found that if a folding palmtop construction  
is used which folds about an axis perpendicular to the  
rows in the keyboard, combined communications and  
20 computer apparatus of great ease of use may be  
constructed.

According to one aspect of the present invention, there  
is provided a palmtop computer apparatus including a  
25 display screen and a landscape format keyboard, both  
mounted in a two-part foldable casing, wherein the hinge  
axis about which the parts of the casing fold is  
substantially perpendicular to the direction of rows of  
keys on the keyboard.

30 According to an alternative aspect, the present invention  
provides combined computer and communications apparatus  
including a casing having two portions hinged to one  
another and foldable from a closed folded condition to an

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- open generally flat condition, a planar foldable keyboard and a display screen, both accessible when the casing is in the opened condition, the keys on the keyboard being arranged in rows running in a direction substantially perpendicular to the axis of hinging between the two portions of the casing.
- 5
- Part of the casing may include an antenna which may be fixed or slideable between a retracted and an extended position, in both cases extending in a direction parallel to the axis of hinging.
- 10
- Preferably the two portions of the casing are of substantially equal size.
- 15
- The outside of one part of the casing, when closed, may be configured to enable the apparatus to be used as a mobile telephone with the appropriate actuation buttons or the like for this.
- 20
- In a particularly preferred form of the apparatus in accordance with the invention, one portion of the casing contains an aperture and the other a screen, the arrangement being such that the entire screen and the main, usually Qwerty, keyboard are visible when the casing is opened, and at least part of the screen is visible through the aperture when the casing is in the folded condition.
- 25
- 30
- The alpha-numeric keyboard, conventionally of standard qwerty, etc. arrangement, preferably takes the form of a continuous rubber resilient pad keyboard of known type which, by appropriate design, may be made to fold when the unit itself is folded up.

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- Switch means may be associated with the portions of the casing to enable the apparatus to know whether it is folded or flat, and to operate accordingly under software control, e.g. to prevent operation of the device as a computer when the casing is folded shut and optionally preventing operation of the device as a telephone when the casing is opened.
- In a particularly preferred form of the invention, the keyboard for computer input and the actuation pads for the mobile telephone are formed as a single unit which, when inserted in the casing, extends across the lower portion, conveniently usually the lower third to half, of the open casing with the portion constituting the keypad for the telephone folded around to underlie the "front" of the casing when the unit is closed.
- Apparatus according to the present invention has the further advantage of being well suited to use in conjunction with a so-called docking station. Part of the casing may have a connector set in it which may mate with a suitable connector in the docking station to enable a full screen display (conventional video display unit) to be used, e.g. forming part of a standard desktop computer. Data may be exchanged between palmtop and desktop computer in known fashion using such a docking station, or the docking station may effectively be used to convert the palmtop to a desktop machine, which may have other peripherals such as printer, scanner, faxcard etc. connected thereto.
- The invention is illustrated, by way of example, by apparatus constructed in accordance with the invention shown schematically in the accompanying drawings. In

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these drawings:

Figure 1 is a perspective view of apparatus in accordance with the invention folded up and in the "mobile telephone" use position.

5 Figure 2 is a perspective view of the apparatus of Figure 1 unfolded to act as a palm top computer.

10 Figure 3 is a diagrammatic section along the lines 3-3 in Figure 2.

Figure 4 is a diagrammatic section through the lines 4-4 in Figure 1.

15 Figure 5 is a front view of an alternative construction in folded form for use as a mobile telephone, and

20 Figure 6 is a view of a further alternative construction in unfolded condition.

Referring first to the apparatus shown in Figures 1 to 4, a combined palmtop computer and mobile telephone unit is shown with the unit folded in Figures 1 and 4 and opened out for use as a palmtop in Figures 2 and 3. It has a casing having two sections 1 and 2 which can be thought of as the left hand and right hand portions of an opened book. Casing portions 1 and 2 are hinged together as described in more detail below. Mounted in casing portion 2 are a display screen 3, the right hand portion of a flexible keyboard 5 and an antenna 10 for use when the item is used as a mobile telephone. Mounted in casing portion 1 are the left hand portion of keyboard 5, a set of function buttons 6 for use when the apparatus is being

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used as a palmtop computer, an audio transducer acting as the sound output for the telephone via an aperture 11, a numeric and function button keypad with keys 12, again for use when the apparatus is being used as a mobile 5 telephone and a microphone located behind a small set of slots 14. Casing portion 1 also has a window 4 through which a part of screen 3 can be seen when the device is as shown in Figures 1 and 4, which part is used to display information relevant to telephone use, for 10 example the number dialled, a menu of stored numbers, battery power status or which mobile telephone networks are available.

Figures 3 and 4 show schematically the internal 15 construction of the apparatus. Located in casing portion 1 is a battery pack 23 to power the apparatus. Located in casing portion 2 is a circuit board 20 on which a few components are diagrammatically indicated. Near the right hand end of board 20 as shown in Figures 3 and 4 is a 20 socket 21 in which is engaged the end of a flexible membrane 22 bearing conductive tracks and areas and which constitutes part of the keyboard 5. In known fashion, overlying membrane 22 is a rubbery moulded array of keys which each has a conductive surface facing the membrane 25 22 but spaced slightly away from the membrane when no key is depressed. On depressing a key, its underside contacts the membrane surface and connects two adjacent conductive areas, which connection is detected by the standard electronics on board 20 and interpreted by the computer "chips" it carries. Membrane 22 extends under all of the 30 keys of keyboard 5 and then turns down and back (as seen at the left hand end of Figure 3) to lie below keys 12.

Casing sections 1 and 2 are hinged together via an

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arrangement of pivotally mounted plates of which two,  
denoted 33 and 34, are visible in Figure 2 and a cover  
plate 30. Each casing section can pivot relative to plate  
30 about axes 31 and 32. Internally mounted springs (not  
5 shown) may operate in known fashion to urge the casing  
sections to lie preferentially in the opened out flat  
position as shown in Figures 2 and 3 or the folded  
position shown in Figures 1 and 4. To give improved  
support to keyboard 5 when the apparatus is being used as  
10 a palmtop, plate 30 has a flange 35 extending leftwards  
as shown in Figure 3.

When the apparatus is to be used as a palmtop, as shown  
in Figures 2 and 3, the entire screen 3 is visible and  
15 the keyboard 5, which as shown is of standard querty  
arrangement, can be used. It is of particular  
convenience that the palmtop can be used held in the  
user's hands or on a surface such as a desktop or table.  
In the first case, the user's left and right hand fingers  
20 support casing sections 1 and 2 respectively and the  
thumbs are used to depress the keys on keyboard 5, with  
the left thumb used to operate function buttons 6. In the  
second, the keyboard can simply be used with as many  
fingers and thumbs as the user habitually uses when  
25 operating a standard alphanumeric keyboard.

When it is desired to use the device as a telephone,  
casing portions 1 and 2 are folded together and the  
apparatus assumes the configuration shown in Figures 1  
30 and 4. As can be seen, this resembles a standard mobile  
telephone unit. Part of the screen can be seen through  
the window 4 and the various function buttons and numeric  
keypad 12 are accessible for mobile telephone operation.

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Figures 5 and 6 show variations of the detailed arrangements shown in Figures 1 to 4. In the variant shown in Figure 5, the number of operation buttons has been reduced to four, viz SEND and END buttons 40 and 41 and scroll down and up buttons 42 and 43. In Figure 6, 5 the display screen for viewing when the apparatus is being used as a palmtop computer is the full width of keyboard 5, and is formed by using a flexible liquid crystal display screen of appropriate construction.

10 Clearly in the case of the apparatus shown in Figure 6, the window 4 going right through casing portion 1 is omitted. Instead, a small display screen dedicated to mobile communications use, for status display or as a pager display, can be easily mounted in casing portion 1 15 underlying the left hand part of screen 50.

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CLAIMS

1. Combined computer and communications apparatus including a casing having two portions hinged to one another and foldable from a closed folded condition to an open generally flat condition, a planar foldable keyboard and a display screen, both accessible when the casing is in the opened condition, the keys on the keyboard being arranged in rows running in a direction substantially perpendicular to the axis of hinging between the two portions of the casing.
2. A palmtop computer apparatus including a display screen and a landscape format keyboard, both mounted in a two-part foldable casing, wherein the hinge axis about which the parts of the casing fold is substantially perpendicular to the direction of rows of keys on the keyboard.
3. Apparatus according to claim 1 or 2 wherein the two portions of the casing are of substantially equal size.
4. Apparatus according to any one of the preceding Claims wherein one portion of the casing includes an antenna slid able between a retracted and an extended position in a direction parallel to the axis of hinging.
5. Apparatus according to any one of the preceding Claims and having on the outside of one portion of the casing when in closed folded condition a plurality of actuation buttons enabling the apparatus to be used as a mobile telephone.
6. Apparatus according to any one of the preceding

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Claims wherein one portion of the casing contains an aperture and the other a screen, the arrangement being such that the entire screen is visible when the casing is opened to reveal the keyboard and at least part of the 5 screen is visible through the aperture when the casing is in folded condition.

7. Apparatus according to any one of the preceding  
Claims wherein the keyboard is in the form of a  
10 continuous rubber resilient pad keyboard foldable  
generally about a line perpendicular to the rows of keys  
therein.

8. Apparatus according to any one of the preceding  
15 Claims and including switch means adapted to enable the apparatus to know whether it is folded closed or opened out flat.

9. Apparatus according to any one of the preceding  
20 Claims wherein the keyboard is a full Qwerty keyboard for computer input and actuation pads for mobile telephone operation are formed as a single unit with the keyboard which extends across the lower half of the casing when unfolded flat, and which is folded round to underlie the 25 front of the casing when the casing is folded closed.

## AMENDED CLAIMS

[received by the International Bureau on 20 April 1998 (20.04.98);  
original claim 2 amended; remaining claims unchanged (1 page)]

1. Combined computer and communications apparatus including a casing having two portions hinged to one another and foldable from a closed folded condition to an open generally flat condition, a planar foldable keyboard and a display screen, both accessible when the casing is in the opened condition, the keys on the keyboard being arranged in rows running in a direction substantially perpendicular to the axis of hinging between the two portions of the casing.
2. A palmtop computer apparatus including a display screen and a foldable landscape format keyboard, both mounted in a two-part foldable casing, wherein the hinge axes about which the parts of the casing and the keyboard fold are substantially perpendicular to the direction of rows of keys on the keyboard.
3. Apparatus according to claim 1 or 2 wherein the two portions of the casing are of substantially equal size.
4. Apparatus according to any one of the preceding Claims wherein one portion of the casing includes an antenna slidable between a retracted and an extended position in a direction parallel to the axis of hinging.
5. Apparatus according to any one of the preceding Claims and having on the outside of one portion of the casing when in closed folded condition a plurality of actuation buttons enabling the apparatus to be used as a mobile telephone.
6. Apparatus according to any one of the preceding

AMENDED SHEET (ARTICLE 19)

**STATEMENT UNDER ARTICLE 19**

Claim 2 has been reworded to clarify the distinction between the dissected keyboards disclosed in the prior art and the foldable keyboard used in the present invention. The description at page 3, lines 23-29 will need to be amended to match. EP-A-0005661 will need to be acknowledged in the description.

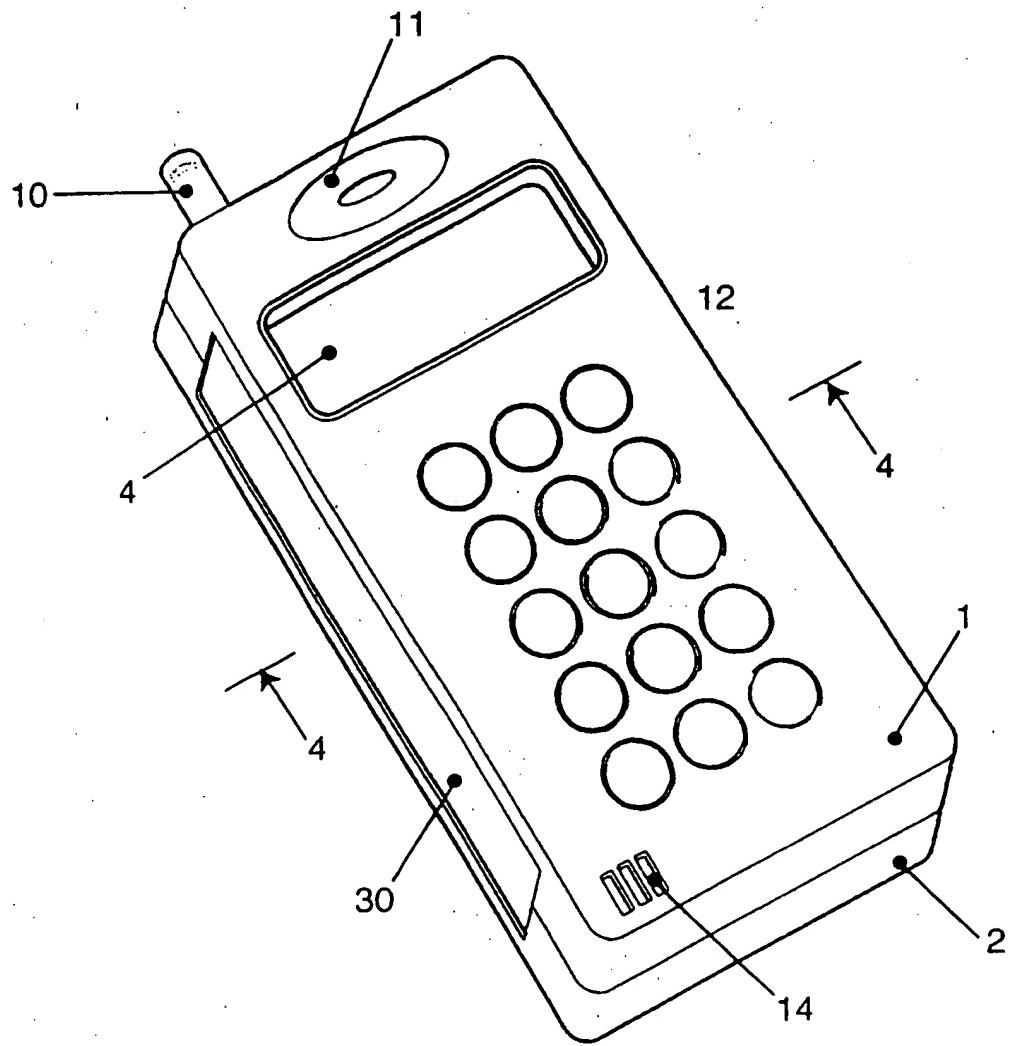


Fig. 1

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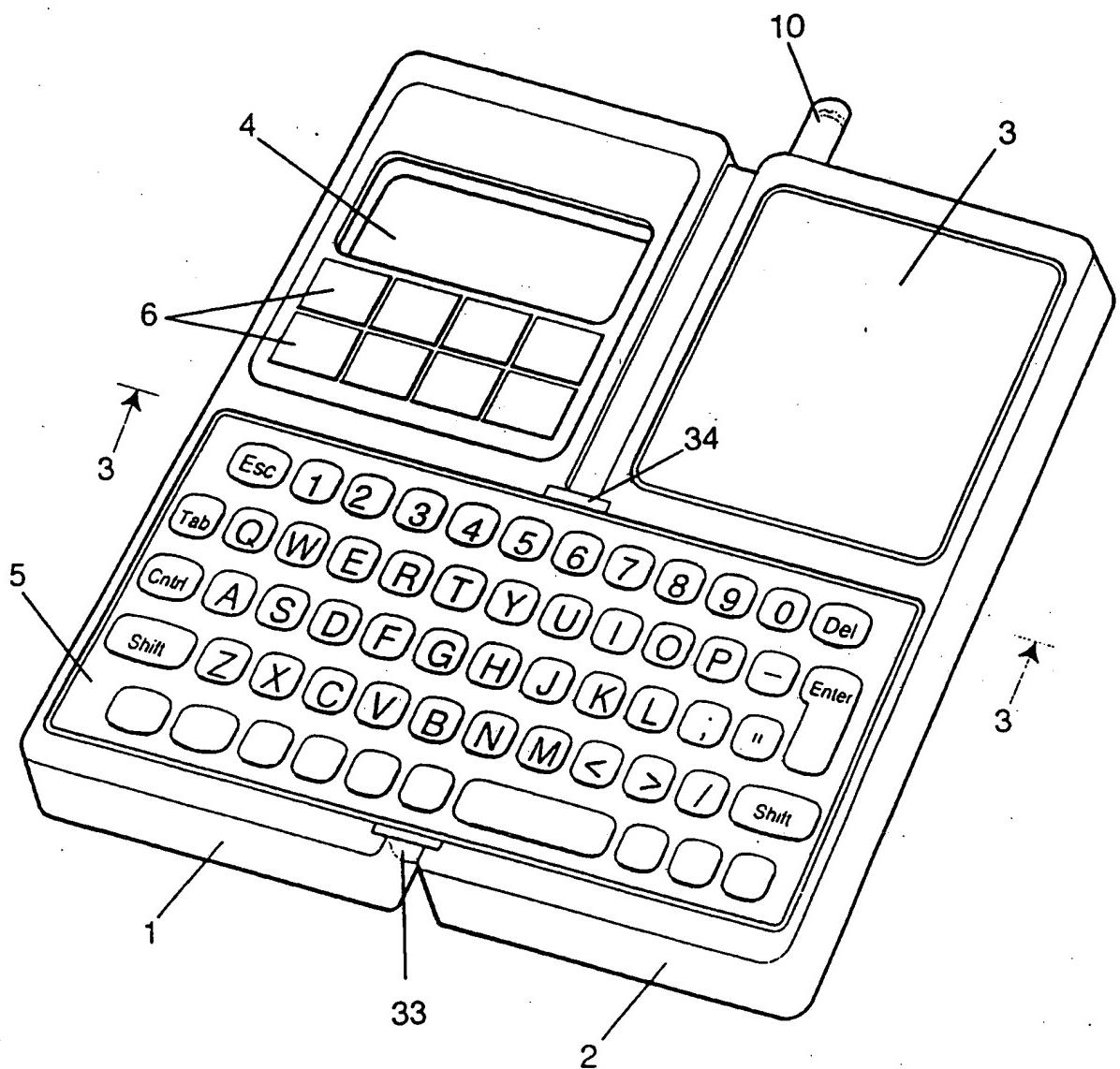


Fig. 2

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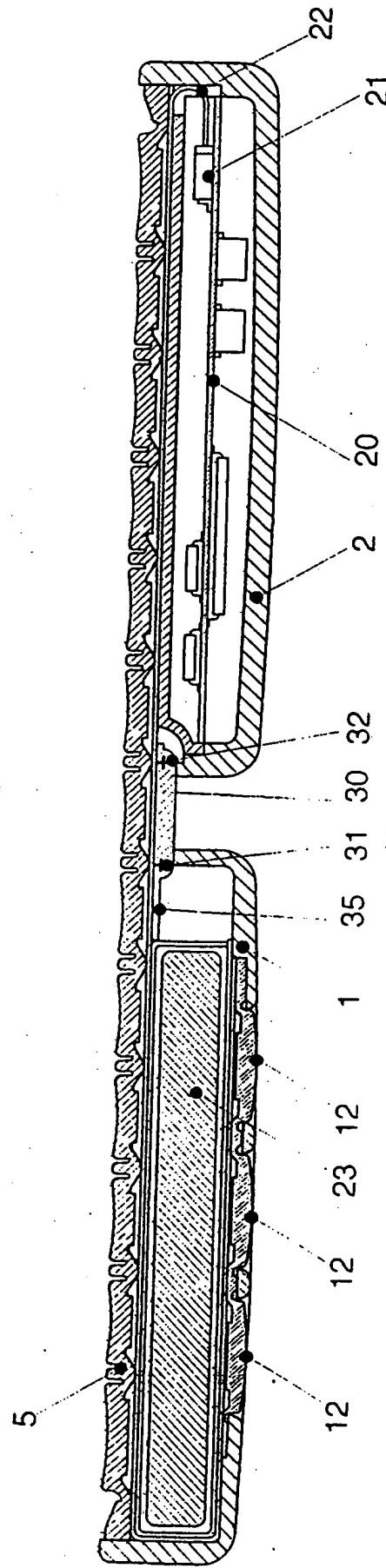


Fig. 3

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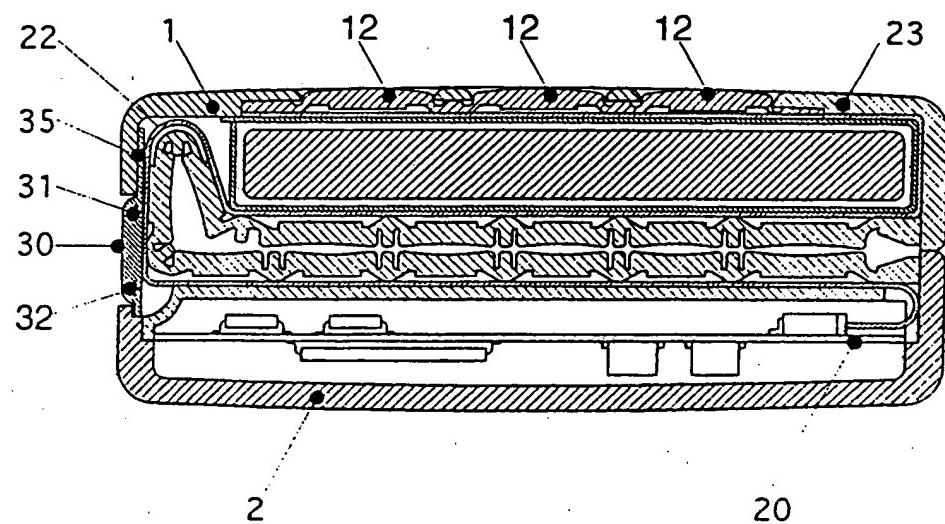


Fig. 4

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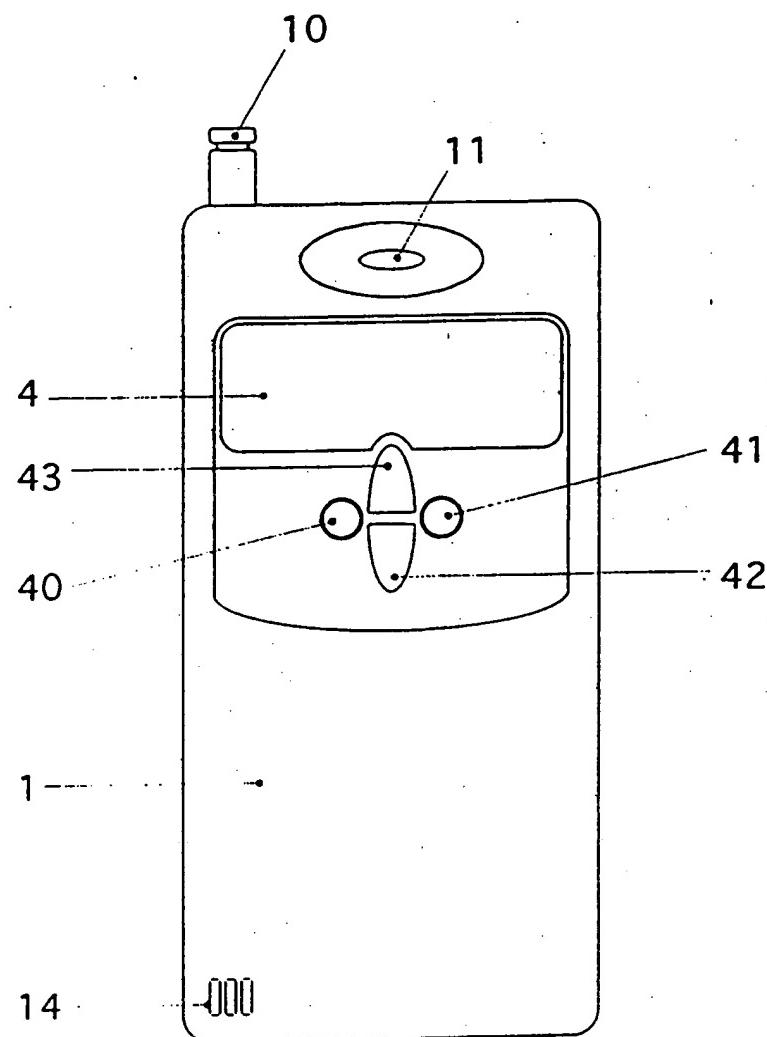


Fig.5

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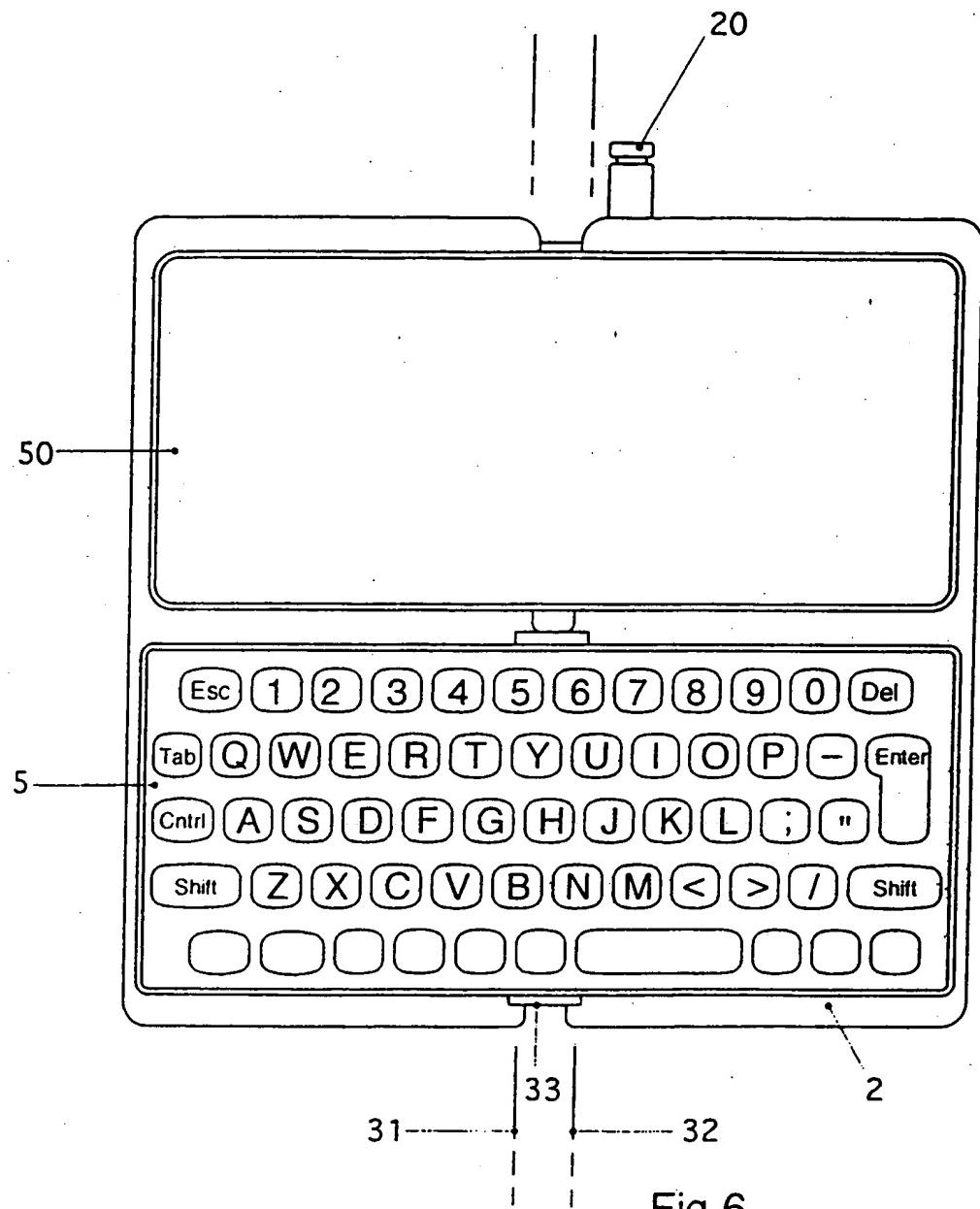


Fig.6

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# INTERNATIONAL SEARCH REPORT

Int'l. Application No  
PCT/GB 97/02950

**A. CLASSIFICATION OF SUBJECT MATTER**  
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Minimum documentation searched (classification system followed by classification symbols)

**IPC 6 G06F H04M**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 005 661 A (REALISA INF & AUTOMAT ;NAUGES LOUIS (FR)) 28 November 1979 see abstract see page 4, line 25 - line 35; figure 4 ---	2,3
A	EP 0 534 478 A (CASIO COMPUTER CO LTD) 31 March 1993 cited in the application see abstract see column 3, line 40 - column 4, line 36; figures 2,3 see column 4, line 43 - line 54; figure 4 see column 12, line 32 - line 36 ---	1,4,5,8
A	DE 295 19 570 U (CONSTIN DESIGN GMBH) 28 March 1996 see page 3, line 20 - page 4, line 7; figures 1,2 ---	1,3-5

Further documents are listed in the continuation of box C.

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1 Date of the actual completion of the international search Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 97/02950

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 291 560 A (MOTOROLA INC) 24 January 1996 cited in the application see abstract see page 2, line 23 - line 32; figures 1,2 ---	1,4-6,8
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 003, 28 April 1995 & JP 06 337733 A (MUTSUO KAWASAKI), 6 December 1994, see abstract ---	2,3
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 007, 31 August 1995 & JP 07 093069 A (ATSUKO ITO), 7 April 1995, see abstract ---	2,3
A	PATENT ABSTRACTS OF JAPAN vol. 005, no. 069 (P-060), 9 May 1981 & JP 56 017427 A (CANON INC), 19 February 1981, see abstract -----	2,7,9

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/GB 97/02950

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0005661 A	28-11-79	FR 2425675 A	07-12-79
EP 0534478 A	31-03-93	DE 69216971 D DE 69216971 T JP 5211464 A KR 9608830 B US 5337346 A	06-03-97 15-05-97 20-08-93 05-07-96 09-08-94
DE 29519570 U	28-03-96	DE 19520947 A WO 9638970 A DE 29610265 U	12-12-96 05-12-96 24-10-96
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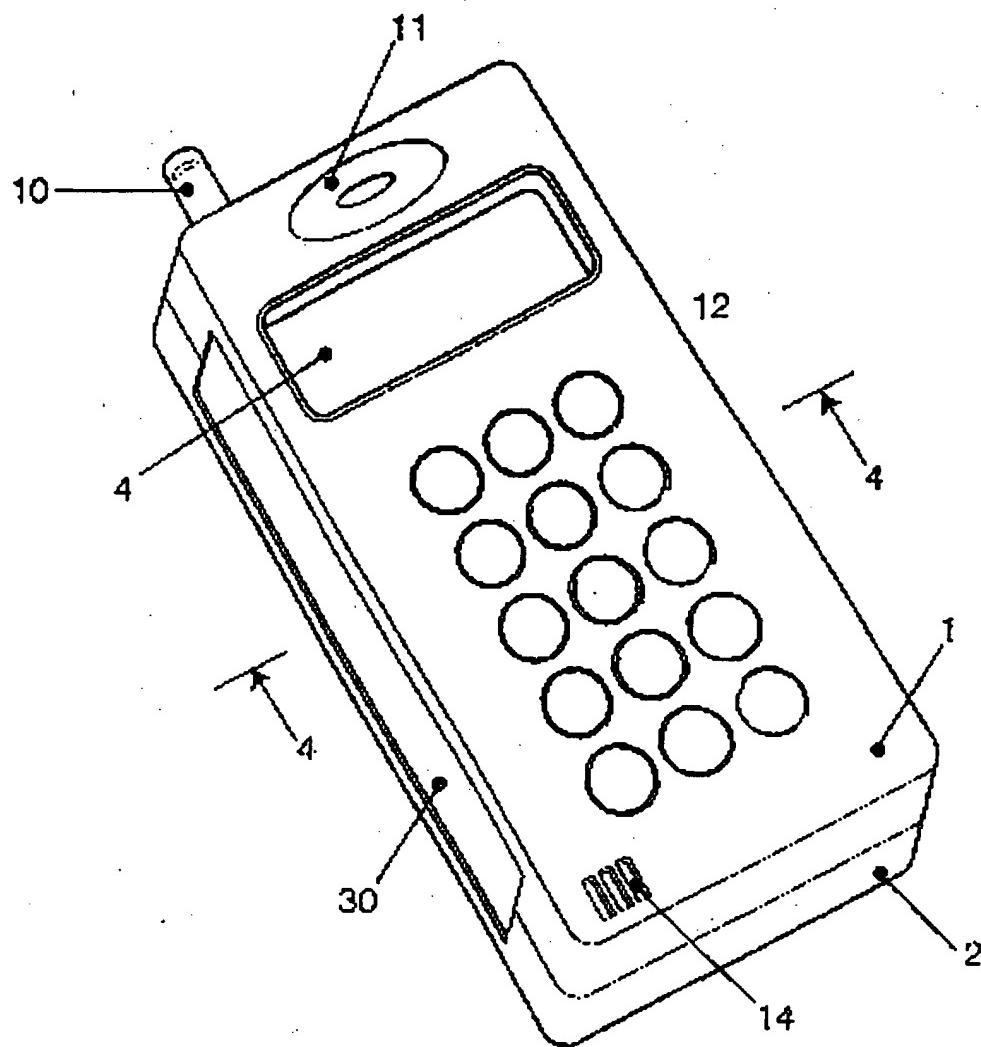


Fig. 1

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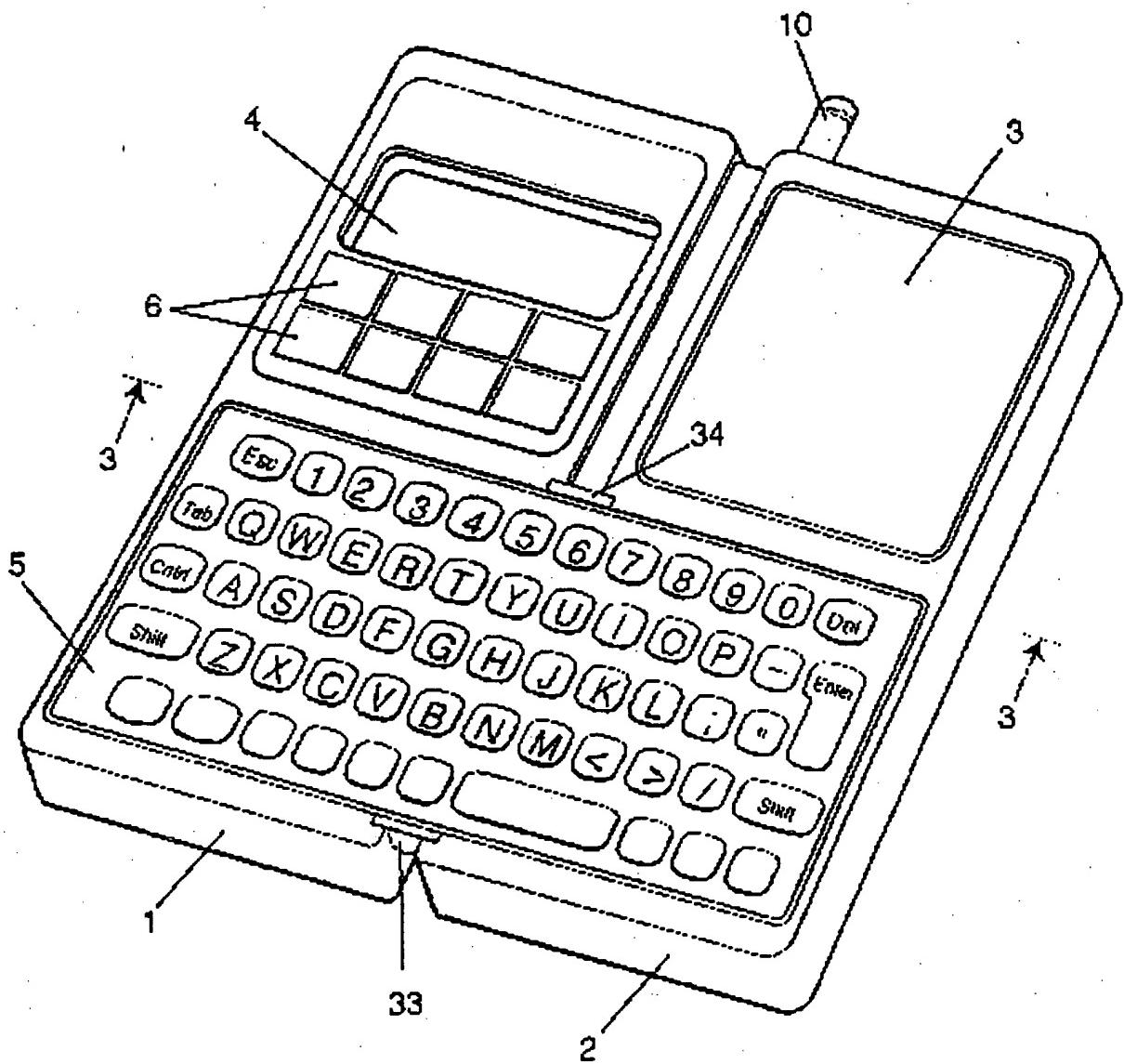


Fig. 2

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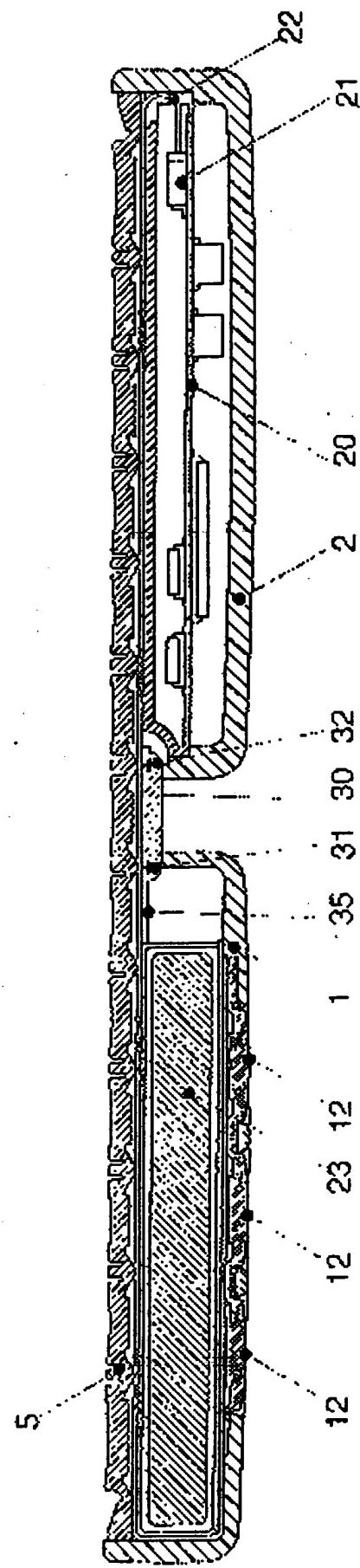


Fig. 3

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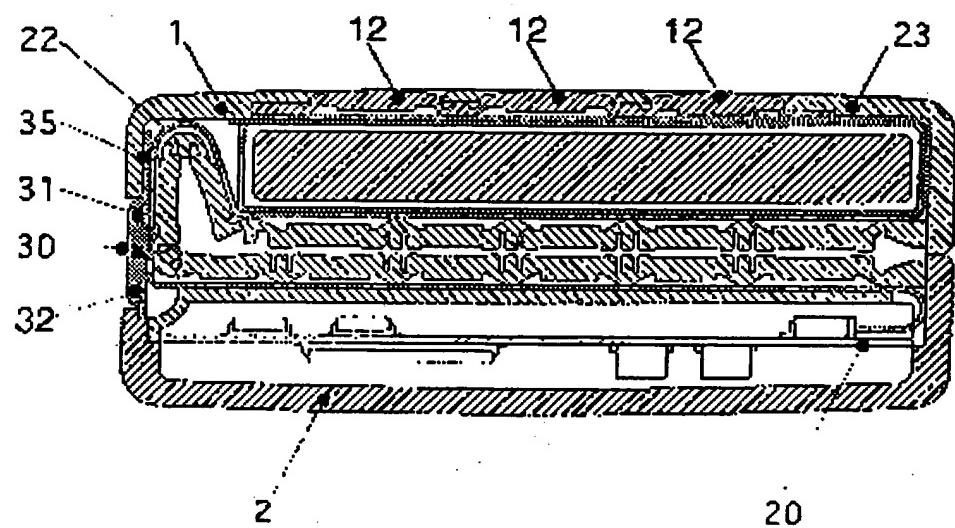


Fig. 4

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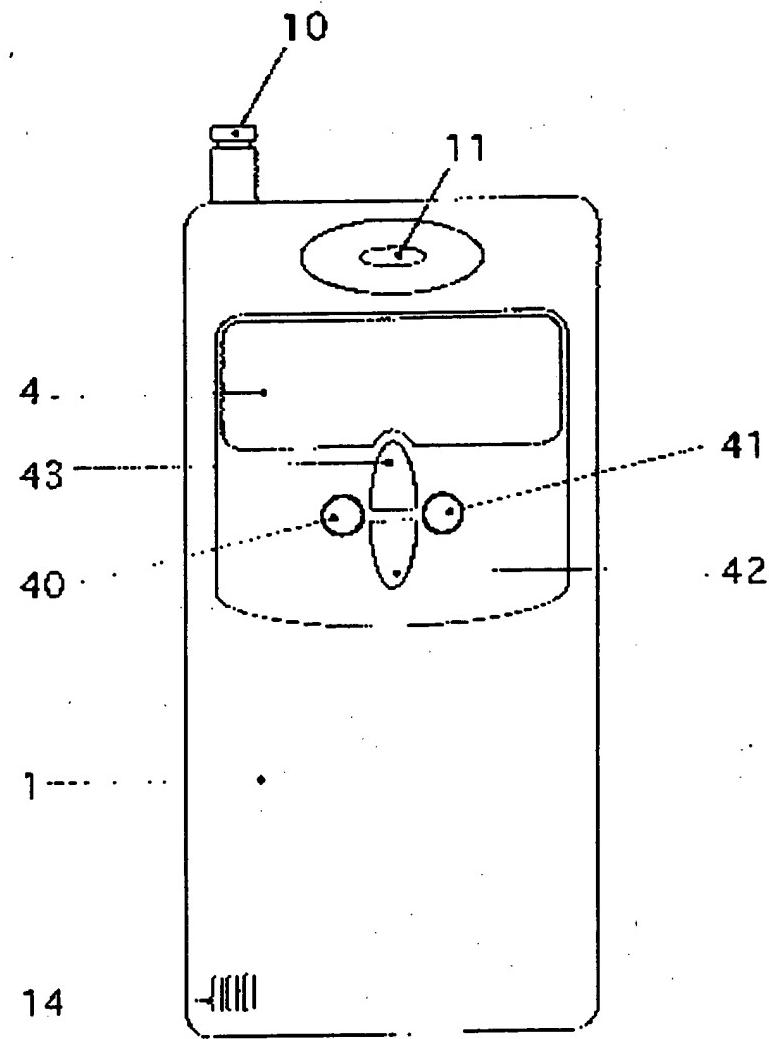


Fig.5

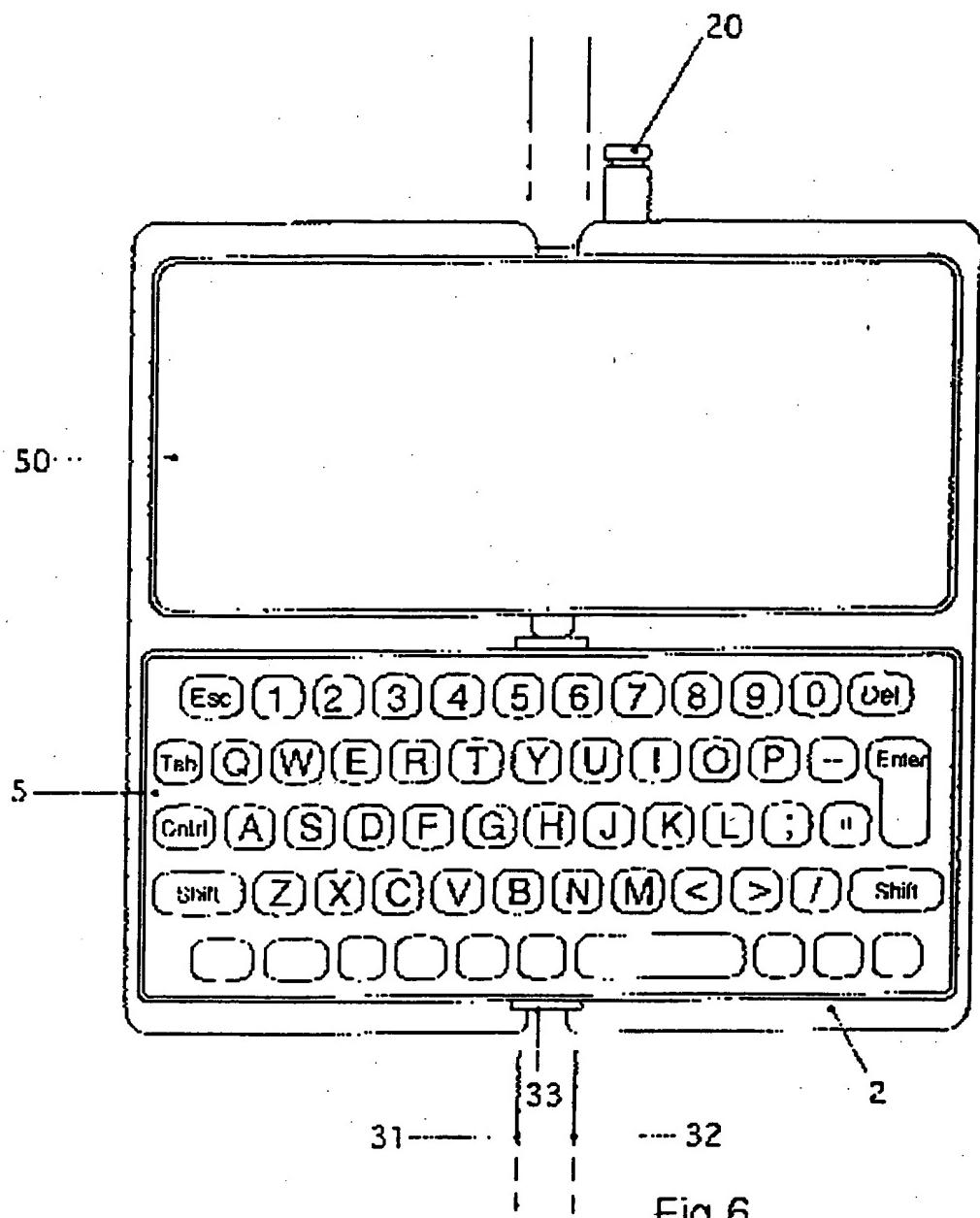


Fig.6

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